

TABLE W-20

Exposure Parameters for Upper Trophic Level Ecological Receptors—Step 3

*St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri*

Receptor	Body Weight (kg)		Water Ingestion Rate (L/day)		Food Ingestion Rate (kg/day - dry)	
	Value	Reference	Value	Reference	Value	Reference
<b>Birds</b>						
Rufous-Sided Towhee	0.04	Clench and Leberman 1978	0.0067	allometric equation	0.0071	allometric equation
Wild Turkey	3.20	Eaton 1992	0.1286	allometric equation	0.1241	allometric equation
<b>Mammals</b>						
Coyote	9.76	Bekoff 1977	0.7694	allometric equation	0.4470	allometric equation
Short-Tailed Shrew	0.017	USEPA 1993a	0.0038	USEPA 1993a	0.0015	USEPA 1993a
White-Footed Mouse	0.021	Silva and Downing 1995	0.0062	Sample and Suter 1994	0.0005	Sample and Suter 1994
White-Tailed Deer	52.9	Silva and Downing 1995	3.5216	allometric equation	0.2610	Sample and Suter 1994

TABLE W-20

Exposure Parameters for Upper Trophic Level Ecological Receptors—Step 3

*St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri*

Receptor	Dietary Composition (percent)						Reference	Soil/ Sediment Ingestion (percent)	
	Terr. Plants	Soil Invert.	Small Mammals	Fish/ Frogs	Aquatic Plants	Benthic Invert.		Value	Reference
<b>Birds</b>									
Rufous-Sided Towhee	41.6	58.4	0	0	0	0	Greenlaw 1996	0	Greenlaw 1996
Wild Turkey	96.4	3.6	0	0	0	0	Shemnitz 1956	0	Shemnitz 1956
<b>Mammals</b>									
Red Fox	7.0	2.8	87.4	0	0	0	USEPA 1993a	2.8	Beyer et al. 1994
Short-Tailed Shrew	4.7	82.3	0	0	0	0	USEPA 1993a; Sample and Suter 1994	13.0	Sample and Suter 1994
White-Footed Mouse	51.0	47.0	0	0	0	0	Martin et al. 1951; Sample and Suter 1994	2.0	Beyer et al. 1994
White-Tailed Deer	98.0	0	0	0	0	0	Sample and Suter 1994	2.0	Beyer et al. 1994

TABLE W-21

Comparison of Detected Surface Soil Concentrations to Direct Exposure Screening Values  
*St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri*

Inorganics (mg/kg)	Mean Concentration	Screening Value	Mean Hazard Quotient
Arsenic	9.10	18	0.51
Barium	169.52	330	0.51
Chromium	14.70	0.4	37
Copper	50.17	70	0.72
Lead	136.76	120	1.1
Manganese	684.75	220	3.1
Mercury	0.07	0.1	0.69
Selenium	1.56	0.52	3.0
Thallium	14.06	1.0	14
Vanadium	25.99	2.0	13
Zinc	162.55	120	1.4

TABLE W-22

Comparison of White-footed Mouse Exposure Doses to Ingestion Screening Values - PCOC Refinement

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Chemical	Soil Concentration (mg/kg)	Soil - Plant BCF	Terrestrial Plant Concentration (mg/kg dry)	Soil - Invertebrate BAF	Terrestrial Invertebrate Concentration (mg/kg)	Surface Water Concentration (mg/L)	Dietary Intake (mg/kg/d)	NOAEL TRV (mg/kg/d)	LOAEL TRV (mg/kg/d)	NOAEL HQ	LOAEL HQ
Arsenic	9.10	0.037	0.337	0.258	2.347	0	0.0350	0.126	1.26	0.28	0.028
Cadmium	1.58	0.514	0.810	7.660	12.065	0	0.1467	1	10	0.15	0.015
Chromium	14.70	0.048	0.706	0.320	4.705	0	0.0687	3.28	32.8	0.021	<0.01
Lead	136.76	0.038	5.156	0.31	41.982	0	0.6022	8	80	0.08	0.008
Mercury	0.07	0.34	0.024	1.2	0.082	0	0.0012	0.032	0.16	0.039	<0.01
Selenium	1.56	0.567	0.884	0.982	1.530	0	0.0288	0.2	0.33	0.14	0.087
Silver	5.30	0.013	0.067	2.0	10.847	0	0.1257	1.812	18.12	0.069	<0.01
Zinc	162.55	0.36	58.146	2.5	403.413	0	5.3388	160	320	0.033	0.017

$$DI_x = \frac{\sum (FIR)(FC_x)(PDF_i) + [(FIR)(SC_x)(PDS) + (WIR)(WC_x)]}{BW}$$

DI = Chemical-specific = Dietary intake for chemical (mg chemical/kg body weight/day)

FIR = 0.000499062 = Food ingestion rate (kg/day dry weight)

FC<sub>xi</sub> = Chemical-specific = Concentration of chemical in food item (plants, mg/kg, dry weight basis)PDF<sub>i</sub> = 0.51 = Proportion of diet composed of food item (plants, dry weight basis)FC<sub>xi</sub> = Chemical-specific = Concentration of chemical in food item (invertebrates, mg/kg, dry weight basis)PDF<sub>i</sub> = 0.47 = Proportion of diet composed of food item (invertebrates, dry weight basis)SC<sub>x</sub> = Chemical-specific = Concentration of chemical in soil (mg/kg, dry weight)

PDS = 0.02 = Proportion of diet composed of soil (dry weight basis)

WIR = 0.00624 = Water ingestion rate (L/day)

WC<sub>x</sub> = Chemical-specific = Concentration of chemical in water (mg/L)

BW = 0.0208 = Body weight (kg wet weight)

$$HQ = \frac{DI_x}{\text{Screening Value}}$$

TABLE W-23

Comparison of Short-tailed Shew Exposure Doses to Ingestion Screening Values - PCOC Refinement

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Inorganics (mg/kg)	Soil Concentration (mg/kg)	Soil - Plant BCF	Terrestrial Plant Concentration (mg/kg dry)	Soil - Invertebrate BAF	Terrestrial Invertebrate Concentration (mg/kg)	Surface Water Concentration (mg/L)	Dietary Intake (mg/kg/d)	NOAEL TRV (mg/kg/d)	LOAEL TRV (mg/kg/d)	NOAEL HQ	LOAEL HQ
Arsenic	9.10	0.037	0.337	0.258	2.347	0	0.277	0.126	1.26	2.2	0.22
Cadmium	1.58	0.514	0.810	7.660	12.065	0	0.900	1	10	0.90	0.090
Chromium	14.70	0.048	0.706	0.320	4.705	0	0.515	3.28	32.8	0.16	0.016
Copper	50.17	0.123	6.174	0.468	23.484	0	2.313	78	104	0.030	0.022
Lead	136.76	0.038	5.156	0.31	41.982	0	4.653	8	80	0.58	0.06
Mercury	0.07	0.34	0.024	1.2	0.082	0	0.007	0.032	0.16	0.21	0.043
Selenium	1.56	0.567	0.884	0.982	1.530	0	0.133	0.2	0.33	0.67	0.40
Silver	5.30	0.013	0.067	2.0	10.847	0	0.851	1.812	18.12	0.47	0.047
Zinc	162.55	0.36	58.146	2.5	403.413	0	31.495	160	320	0.20	0.10

$$DI_x = \frac{\sum (FIR)(FC_{xi})(PDF_i) + [(FIR)(SC_x)(PDS) + [(WIR)(WC_x)]]}{BW}$$

DI = Chemical-specific = Dietary intake for chemical (mg chemical/kg body weight/day)

FIR = 0.0015 = Food ingestion rate (kg/day dry weight)

FC<sub>xi</sub> = Chemical-specific = Concentration of chemical in food item (plants, mg/kg, dry weight basis)PDF<sub>i</sub> = 0.047 = Proportion of diet composed of food item (plants, dry weight basis)FC<sub>xi</sub> = Chemical-specific = Concentration of chemical in food item (invertebrates, mg/kg, dry weight basis)PDF<sub>i</sub> = 0.823 = Proportion of diet composed of food item (invertebrates, dry weight basis)SC<sub>x</sub> = Chemical-specific = Concentration of chemical in soil (mg/kg, dry weight)

PDS = 0.13 = Proportion of diet composed of soil (dry weight basis)

WIR = 0.0038 = Water ingestion rate (L/day)

WC<sub>x</sub> = Chemical-specific = Concentration of chemical in water (mg/L)

BW = 0.017 = Body weight (kg wet weight)

$$HQ = \frac{DI_x}{\text{Screening Value}}$$

TABLE W-24

Comparison of Coyote Exposure Doses to Ingestion Screening Values - PCOC Refinement

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Chemical	Soil Concentration (mg/kg)	Soil - Plant BCF	Terrestrial Plant	Soil -	Terrestrial Invertebrate	Soil -	Mouse	Soil -	Shrew	Surface Water	Dietary Intake	NOAEL	LOAEL	NOAEL HQ	LOAEL HQ
			Concentration (mg/kg dry)	Invertebrate BAF	Concentration (mg/kg dry)	Mouse BAF	Concentration (mg/kg)	Shrew BAF	Concentration (mg/kg)	Concentration (mg/L)		TRV (mg/kg/d)	TRV (mg/kg/d)		
Copper	51.16	0.123	6.296	0.468	23.949	0.111	5.664	0.502	25.667	0	0.743524	11.7	15.14	0.06	0.049
Lead	147.65	0.038	5.567	0.31	45.324	0.055	8.096	0.148	21.820	0	0.864011	4.7	23.5	0.18	0.037
Selenium	1.56	0.567	0.884	0.982	1.530	0.258	0.402	0.273	0.425	0	0.023349	0.2	0.33	0.12	0.07
Silver	5.16	0.013	0.065	2.0	10.555	0.151	0.781	0.036	0.184	0	0.039671	9.06	45.3	<0.01	<0.01
Zinc	165.54	0.358	59.218	2.482	410.849	0.509	84.300	0.862	142.690	0	5.47174	20.8	208	0.26	0.026

$$DI_x = \frac{\sum (FIR)(FC_{di})(PDF_i) + [(FIR)(SC_x)(PDS) + [(WIR)(WC_x)]}{BW}$$

DI = Chemical-specific = Dietary intake for chemical (mg chemical/kg body weight/day)

FIR = 0.447 = Food ingestion rate (kg/day dry weight, from Table)

FC<sub>xi</sub> = Chemical-specific = Concentration of chemical in food item (plants, mg/kg, dry weight basis)PDF<sub>i</sub> = 0.07 = Proportion of diet composed of food item (plants, dry weight basis, from Table)FC<sub>xi</sub> = Chemical-specific = Concentration of chemical in food item (invertebrates, mg/kg, dry weight basis)PDF<sub>i</sub> = 0.028 = Proportion of diet composed of food item (invertebrates, dry weight basis, from Table)FC<sub>xi</sub> = Chemical-specific = Concentration of chemical in food item (mouse, mg/kg, dry weight basis)PDF<sub>i</sub> = 0.437 = Proportion of diet composed of food item (mouse, dry weight basis, from Table)FC<sub>xi</sub> = Chemical-specific = Concentration of chemical in food item (shrew, mg/kg, dry weight basis)PDF<sub>i</sub> = 0.437 = Proportion of diet composed of food item (shrew, dry weight basis, from Table)SC<sub>x</sub> = Chemical-specific = Concentration of chemical in soil (mg/kg, dry weight, maximum from Table)

PDS = 0.028 = Proportion of diet composed of soil (dry weight basis, from Table)

WIR = 0.769 = Water ingestion rate (L/day, from Table)

WC<sub>x</sub> = Chemical-specific = Concentration of chemical in water (mg/L, maximum from)

BW = 9.76 = Body weight (kg wet weight, minimum from Table)

$$HQ = \frac{DI_x}{\text{Screening Value (from Table)}}$$

TABLE W-25

Comparison of White-tailed Deer Exposure Doses to Ingestion Screening Values - PCOC Refinement

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Chemical	Soil Concentration (mg/kg)	Soil - Plant BCF	Terrestrial Plant Concentration (mg/kg dry)	Surface Water Concentration (mg/L)	Dietary Intake (mg/kg/d)	NOAEL TRV (mg/kg/d)	LOAEL TRV (mg/kg/d)	NOAEL HQ	LOAEL HQ
Arsenic	9.06	0.037	0.335664575	0	0.0025165	0.126	1.26	0.020	<0.01
Lead	147.65	0.038	5.566923748	0	0.0414866	8	80	<0.01	<0.01

$$DI_x = \frac{\sum(FIR)(FC_{xi})(PDF_i) + [(FIR)(SC_x)(PDS) + [(WIR)(WC_x)]}{BW}$$

- DI = Chemical-specific = Dietary intake for chemical (mg chemical/kg body weight/day)  
 FIR = 0.261 = Food ingestion rate (kg/day dry weight, from Table)  
 FC<sub>xi</sub> = Chemical-specific = Concentration of chemical in food item (plants, mg/kg, dry weight basis)  
 PDF<sub>i</sub> = 0.98 = Proportion of diet composed of food item (plants, dry weight basis, from Table)  
 SC<sub>x</sub> = Chemical-specific = Concentration of chemical in soil (mg/kg, dry weight, maximum from Table)  
 PDS = 0.02 = Proportion of diet composed of soil (dry weight basis, from Table)  
 WIR = 3.522 = Water ingestion rate (L/day, from Table)  
 WC<sub>x</sub> = Chemical-specific = Concentration of chemical in water (mg/L, maximum from)  
 BW = 52.9 = Body weight (kg wet weight, minimum from Table)

$$HQ = \frac{DI_x}{\text{Screening Value (from Table)}}$$

TABLE W-26

Comparison of Rufous-sided Towhee Exposure Doses to Ingestion Screening Values - PCOC Refinement

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Chemical	Soil Concentration (mg/kg)	Soil - Plant BCF	Terrestrial Plant Concentration (mg/kg dry)	Soil - Invertebrate BAF	Terrestrial Invertebrate Concentration (mg/kg)	Surface Water Concentration (mg/L)	Dietary Intake (mg/kg/d)	NOAEL TRV (mg/kg/d)	LOAEL TRV (mg/kg/d)	NOAEL HQ	LOAEL HQ
Arsenic	9.10	0.037	0.337	0.258	2.347	0	0.272	2.46	7.38	0.11	0.04
Cadmium	1.58	0.514	0.810	7.660	12.065	0	1.329	1.45	20	0.92	0.066
Chromium	14.70	0.048	0.706	0.320	4.705	0	0.548	1	5	0.55	0.11
Copper	50.17	0.123	6.174	0.468	23.484	0	2.932	47	61.7	0.06	0.048
Lead	136.76	0.038	5.156	0.31	41.982	0	4.802	3.85	19.25	1.2	0.25
Mercury	0.07	0.34	0.024	1.2	0.082	0	0.010	0.026	0.078	0.40	0.13
Selenium	1.56	0.567	0.884	0.982	1.530	0	0.227	0.4	0.8	0.57	0.28
Silver	5.30	0.013	0.067	2.0	10.847	0	1.146	35.6	178	0.032	<0.01
Zinc	162.55	0.36	58.146	2.5	403.413	0	46.783	14.5	131	3.2	0.36

$$DI_x = \frac{\sum (FIR)(FC_{xi})(PDF_i) + [(FIR)(SC_x)(PDS) + (WIR)(WC_x)]}{BW}$$

DI = Chemical-specific = Dietary intake for chemical (mg chemical/kg body weight/day)

FIR = 0.0071 = Food ingestion rate (kg/day dry weight)

FC<sub>xi</sub> = Chemical-specific = Concentration of chemical in food item (plants, mg/kg, dry weight basis)PDF<sub>i</sub> = 0.416 = Proportion of diet composed of food item (plants, dry weight basis)FC<sub>xi</sub> = Chemical-specific = Concentration of chemical in food item (invertebrates, mg/kg, dry weight basis)PDF<sub>i</sub> = 0.584 = Proportion of diet composed of food item (invertebrates, dry weight basis)SC<sub>x</sub> = Chemical-specific = Concentration of chemical in soil (mg/kg, dry weight)

PDS = 0 = Proportion of diet composed of soil (dry weight basis)

WIR = 0.0067 = Water ingestion rate (L/day)

WC<sub>x</sub> = Chemical-specific = Concentration of chemical in water (mg/L)

BW = 0.0393 = Body weight (kg wet weight)

$$HQ = \frac{DI_x}{\text{Screening Value}}$$



TABLE W-27

Comparison of Wild Turkey Exposure Doses to Ingestion Screening Values - PCOC Refinement

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Chemical	Soil Concentration (mg/kg)	Soil - Plant BCF	Terrestrial Plant Concentration (mg/kg dry)	Soil - Invertebrate BAF	Terrestrial Invertebrate Concentration (mg/kg)	Surface Water Concentration (mg/L)	Dietary Intake (mg/kg/d)	NOAEL TRV (mg/kg/d)	LOAEL TRV (mg/kg/d)	NOAEL HQ	LOAEL HQ
Lead	136.76	0.038	5.156	0.307	41.982	0	0.2513899	1.13	11.3	0.22	0.022
Mercury	0.07	0.344	0.024	1.186	0.082	0	0.0010013	0.026	0.078	0.039	0.013
Selenium	1.56	0.567	0.884	0.982	1.530	0	0.0351774	0.4	0.8	0.088	0.044
Zinc	5.30	0.358	1.897	2.482	13.164	0	0.0893129	14.5	131	0.01	0.001

$$DI_x = \frac{\sum (FIR)(FC_{xi})(PDF_i) + [(FIR)(SC_x)(PDS) + [(WIR)(WC_x)]]}{BW}$$

DI = Chemical-specific = Dietary intake for chemical (mg chemical/kg body weight/day)

FIR = 0.124 = Food ingestion rate (kg/day dry weight)

FC<sub>xi</sub> = Chemical-specific = Concentration of chemical in food item (plants, mg/kg, dry weight basis)PDF<sub>i</sub> = 0.964 = Proportion of diet composed of food item (plants, dry weight basis)FC<sub>xi</sub> = Chemical-specific = Concentration of chemical in food item (invertebrates, mg/kg, dry weight basis)PDF<sub>i</sub> = 0.036 = Proportion of diet composed of food item (invertebrates, dry weight basis)SC<sub>x</sub> = Chemical-specific = Concentration of chemical in soil (mg/kg, dry weight)

PDS = 0 = Proportion of diet composed of soil (dry weight basis)

WIR = 0.129 = Water ingestion rate (L/day)

WC<sub>x</sub> = Chemical-specific = Concentration of chemical in water (mg/L)

BW = 3.2 = Body weight (kg wet weight)

$$HQ = \frac{DI_x}{\text{Screening Value}}$$